CLAIMS

1. An abrasion or scratch resistant coating composition comprising :

(A) a component which is the reaction product with oxalic acid of at least one organometallic compound of formula :

$$R^1_y\text{-}M(OR)_{x-y} \quad (I)$$

wherein, M is a metal R is H or an alkyl radical, R^1 is a chelating ligand, x is the valency of the metal, y is an integer at least equal to 1 and x-y is at least equal to 1 ; and

(B) at least one organoalkoxysilane of formula :

$$R^3_n Si(OR^2)_{4-n} \quad (II)$$

wherein, R^2 is an alkyl radical, R^3 is an epoxidized alkyl group and n is an integer from 1 to 3, or a mixture of the organoalkoxysilane of formula (II) with an alkoxysilane of formula (II')

$$R'_{n'} Si(OR'')_{4-n'} \quad (II')$$

wherein n' is an integer from 0 to 3,

R" is H, an alkyl radical or an alkoxyalkyl radical, and

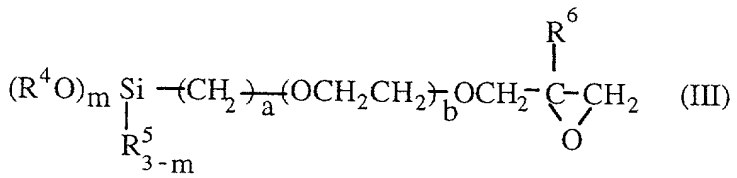
R' is a vinyl, (meth)acryl, aromatic, cyclic or aliphatic alkyl radical.

2. An abrasion-resistant coating composition according to claim, 1 wherein M is selected from Ti, Zr, Sc, Nb, V, Hf, Cr, Y, Al, Ge, Sn, Ta, and W.

3. An abrasion-resistant coating composition according to claim 1, wherein M is Ti or Zr.

4. An abrasion-resistant coating composition according to claim 1, wherein R^1 is a ligand produced from a compound of formula $L^1COCH_2COOL^2$ or $L^3COCH_2COOL^4$, wherein L^1, L^2, L^3 and L^4 are C_1-C_4 lower alkyl groups.

5. An abrasion-resistant coating composition according to claim 1, wherein the organoalkoxysilane has formula :



(III)

wherein R^4 is an alkyl or alkoxy alkyl group having 1 to 4 carbon atoms ; R^5 is an alkyl or aryl group having 1 to 6 carbon atoms ; R^6 is H or a methyl group, m is 2 or 3, a is an integer from 1 to 6 and b is 0, 1 or 2.

6. An abrasion-resistant coating composition according to claim 5, wherein the organoalkoxysilane is selected from the group consisting of γ-glycidoxypropyltrimethoxysilane, γ-glycidoxypropyltriethoxysilane, γ-glycidoxypropylmethyldimethoxysilane, γ-glycidoxypropylmethyldiethoxysilane and γ-glycidoxyethoxypropylmethyldimethoxysilane.

7. An abrasion-resistant coating composition according to claim 1, wherein components (A) and (B) are further partially or fully hydrolyzed.

8. A process for making an abrasion or scratch-resistant coating composition comprising :

(1) reacting with oxalic acid at least one organometallic compound of formula :

$$R^1_y\text{-}M(OR)_{x-y}$$

wherein, M is a metal, R is H or an alkyl radical, R^1 is a chelating ligand, x is the valency of the metal, y is an integer at least equal to 1 and x-y is at least equal to 1 ; and

(2) mixing to the reaction product of (1) at least one organoalkoxysilane of formula :

$$R^3_n Si(OR^2)_{4-n}$$

wherein, R^2 is an alkyl radical, R^3 is an epoxidized alkyl group and n is an integer from 1 to 3.

9. The process according to claim 8, further comprising the step of (3) partially or completely hydrolyzing the mixture obtained in step (2).

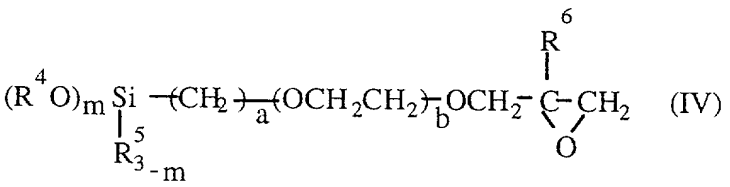
10. The process of claim 8, further comprising the step (3) of adding and mixing a surface-active agent.

11. The process of claim 8, wherein M is selected from Ti, Zr, Sc, Nb, V, Hf, Cr, Y, Al, Ge, Sn, Ta, and W.

12. The process of claim 8, wherein M is Ti or Zr.

13. The process of claim 8, wherein R^1 is a ligand produced from a compound of formula $L^1COCH_2COOL^2$ or $L^3COCH_2COOL^4$, wherein L^1, L^2, L^3 and L^4 are C_1-C_4 lower alkyl groups.

14. The process of claim 8, wherein the organoalkoxysilane has formula :



(IV)

wherein R^4 is an alkyl or alkoxy alkyl group having 1 to 4 carbon atoms ; R^5 is an alkyl or aryl group having 1 to 6 carbon atoms ; R^6 is H or a methyl group, m is 2 or 3, a is an integer from 1 to 6 and b is 0, 1 or 2.

15. The process of claim 8, wherein in step (1) the amount of oxalic acid reacted with the organometallic compounds ranges from 10 to 70 parts by weight based on 100 parts by weight of corresponding tetraalkoxide compound from which compound of formula (I) is derived.

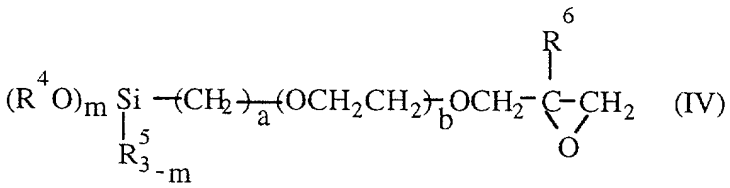
16. The process of claim 8, wherein the amount of organoalkoxysilanes added and mixed in step (2) ranges from 50 to 90 parts by weight percent on 100 parts by weight of component (A).

17. A plastic material substrate coated with a cured layer of an abrasion or scratch resistant coating composition as set forth in claim 1.

18. A plastic material substrate having a first abrasion-resistant coating comprising a (meth)acrylic or polysiloxane cured material and an additional cured abrasion-resistant layer of the composition as set forth in claim 1 deposited on top of the first coating.

19. The plastic material substrate of claim 18, wherein the polysiloxane coating is a coating obtained from a hydrolyzate of a silane compound containing an epoxy group and at least two alkoxy groups directly linked to silicon.

20. The plastic material substrate according to claim 19, wherein the silane compound has formula:



wherein R^4 is an alkyl or alkoxy alkyl group having 1 to 4 carbon atoms ; R^5 is an alkyl or aryl group having 1 to 6 carbon atoms ; R^6 is H or a methyl group, m is 2 or 3, a is an integer from 1 to 6 and b is 0, 1 or 2.

21. A plastic material substrate comprising a first cured layer of an abrasion-resistant composition including at least one hydrolyzate of silane compounds containing an epoxy group and at least two alkoxy groups, colloïdal silica and at least one aluminum chelate compound, wherein an additional cured abrasion-resistant layer of the composition as set forth in claim 1 is deposited on top of the first cured layer.

22. An ophtalmic lens comprising a plastic material substrate having at least one face coated with a cured layer of an abrasion-resistant composition as set forth in claim 1.

23. An opthalmic lens comprising a plastic material substrate coated on at least one face with a first cured layer of an abrasion-resistant composition including at least one hydrolyzate of silane compounds containing an epoxy group and at least two alkoxy groups, colloïdal silica and at least one aluminum chelate compound, and an additional cured abrasion-resistant layer of an abrasion-resistant composition as in claim 1, deposited on top of said first cured layer.